



Credit: AFP/Getty Images

# Overview of Climate Hazards Relevant to Older Adults

Heidi Cullen - Climate Central  
July 19, 2011



# Outline

- [Variability & change within the physical climate system
- [Ongoing & projected future climate impacts/threats
- [Climate change and variability that posing significant risks for older adults



# Seeing Climate



Jackson Pollock Number 8

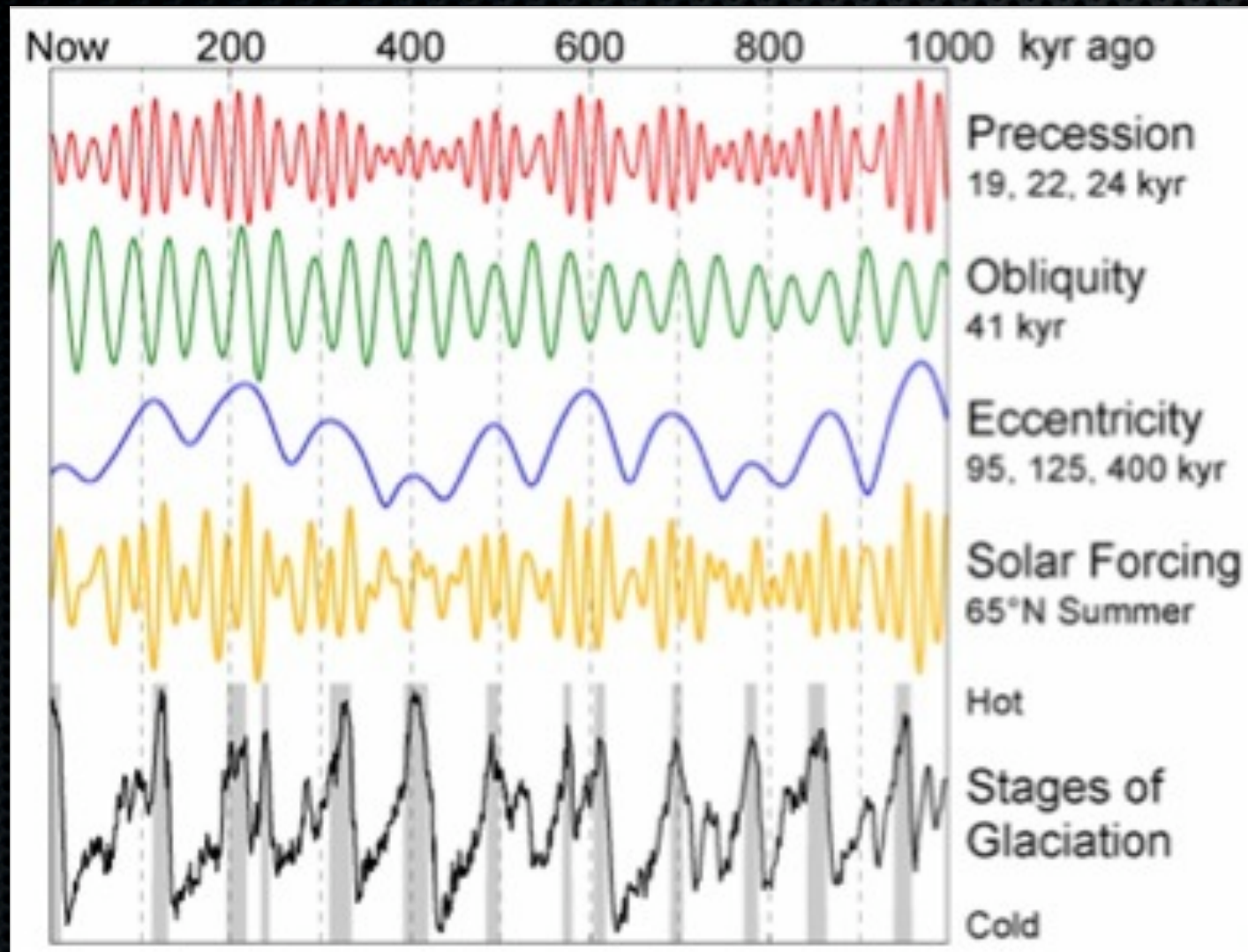


# Seeing Climate





# Seeing Climate



## Natural v. Man-made

——[Low-frequency:

Milankovitch cycles  
Ice sheets  
GHG's (like CO<sub>2</sub>)

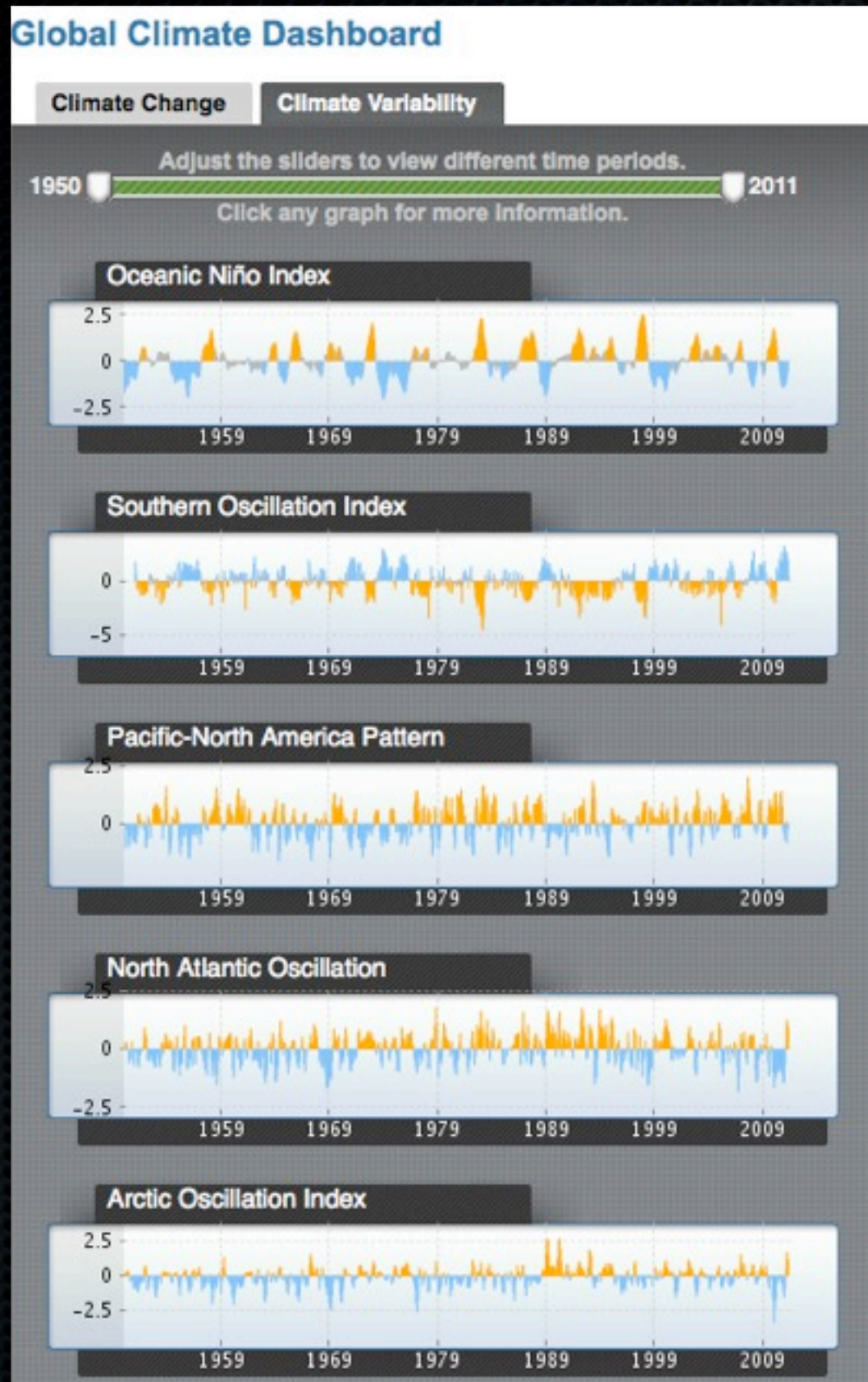
——[High-frequency:

Solar variability (sunspots)  
Volcanic eruptions  
El-Niño  
Us (fossil fuel burning, deforestation)





# Natural climate variability is a **cycle**.



[www.climate.gov](http://www.climate.gov)

— [ **El Niño/La Niña**: periodic warming cooling of tropical Pacific Ocean (2-7 years)

— [ **PNA**: changes in atmospheric pressure between the Aleutian Low and the high pressure over the Rocky Mountains. Strongly influenced by El Niño.

— [ **NAO/AO**: A large scale seesaw in atmospheric mass between the Azores High and Icelandic Low. Varies from year to year, but also can remain in one phase for several years.



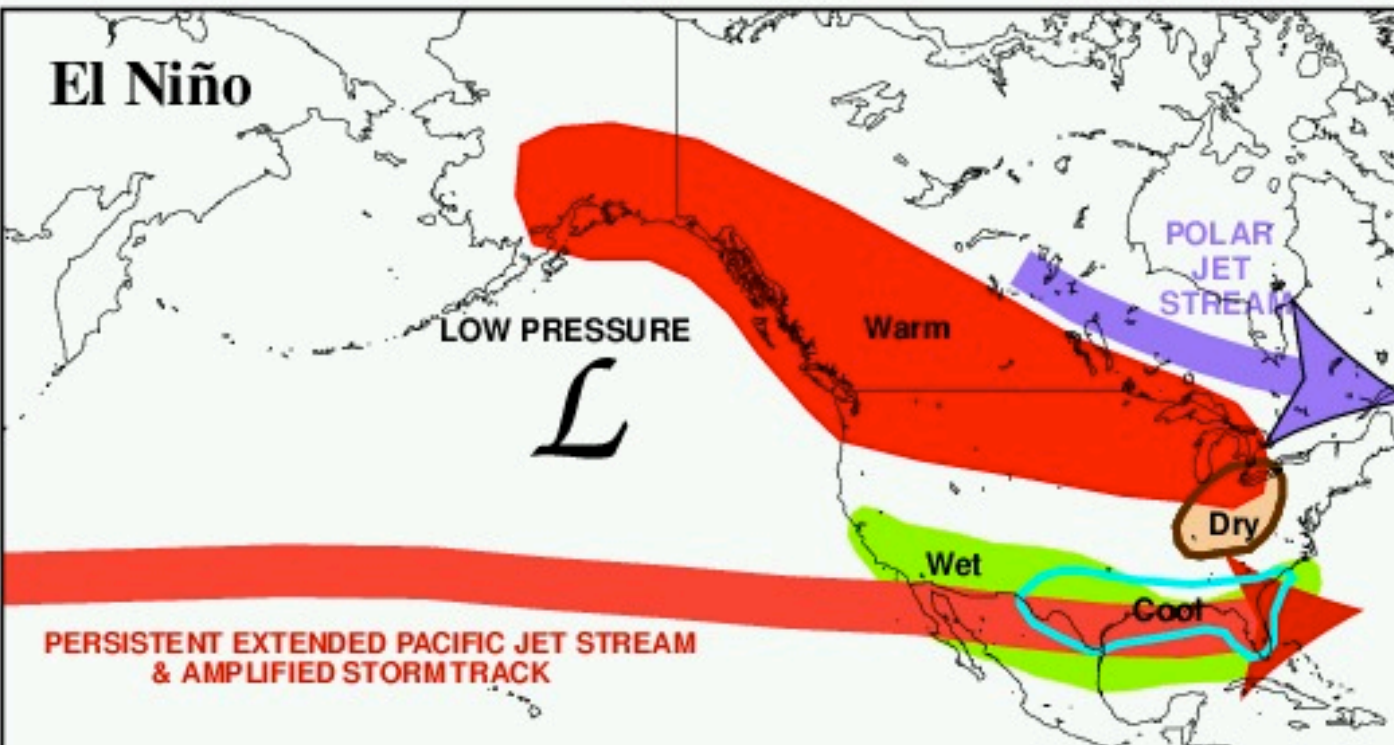
# Natural climate variability is a **cycle**.

— [El Niño: stronger winter storms in California and southern US with floods/landslides.

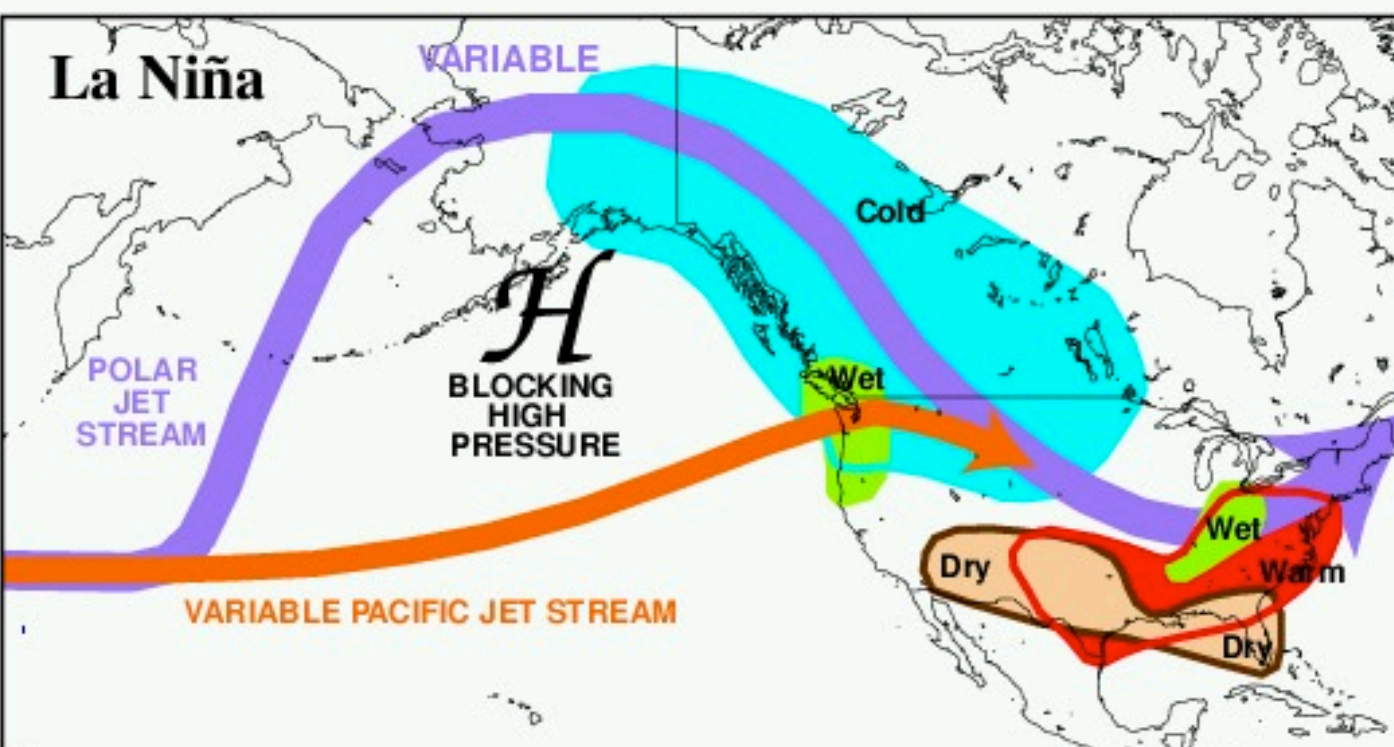
— [La Niña: drier than normal conditions in US Southwest in late summer through subsequent winter. Drier than normal conditions typically occur in Central Plains in fall and in the Southeast in winter. In contrast, the Pacific Northwest is more likely to be wetter than normal in the late fall and early winter. Stronger hurricane season.

**TYPICAL JANUARY-MARCH WEATHER ANOMALIES  
AND ATMOSPHERIC CIRCULATION  
DURING MODERATE TO STRONG  
EL NIÑO & LA NIÑA**

## El Niño



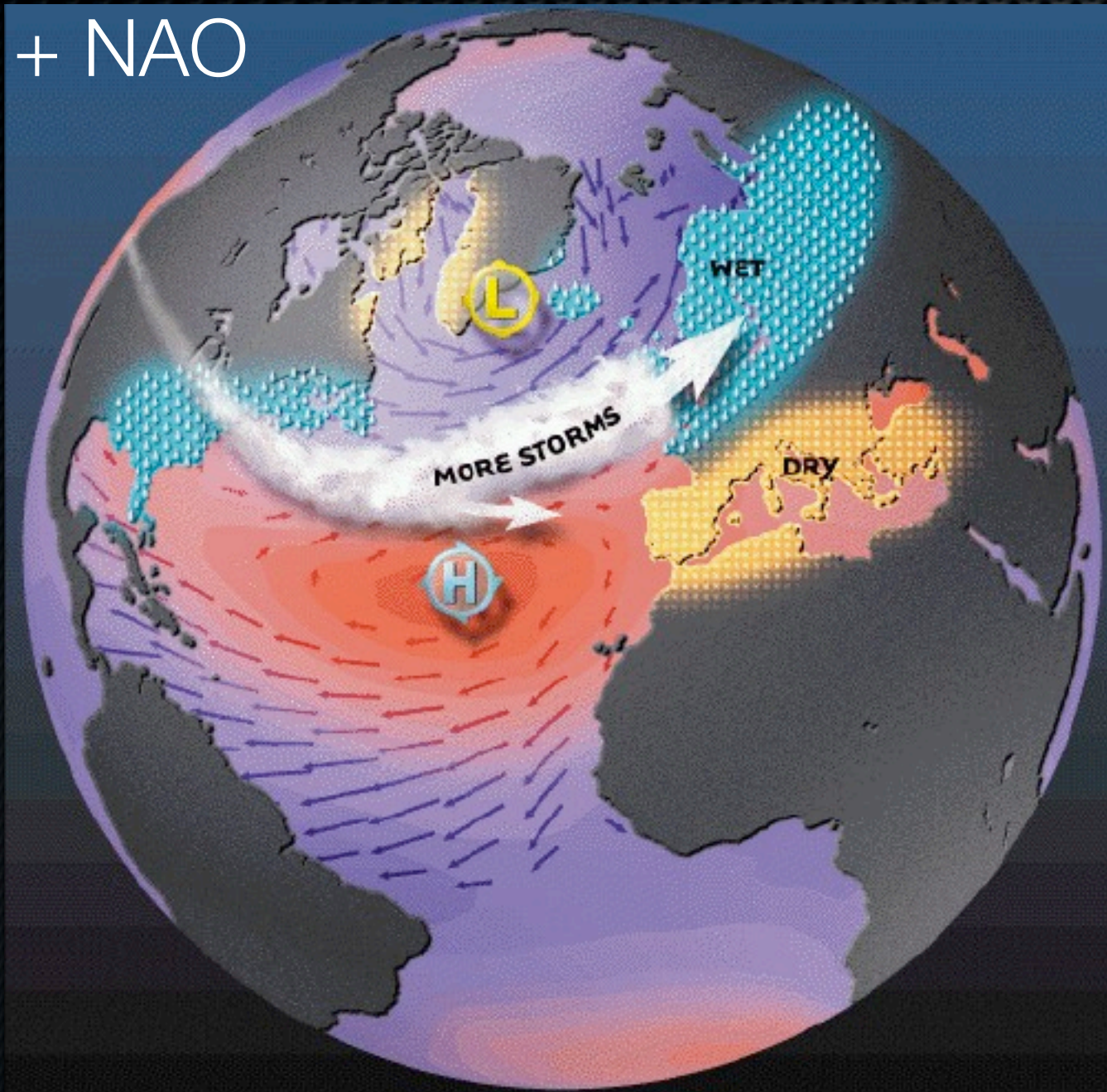
## La Niña





# Natural climate variability is a **cycle**.

+ NAO

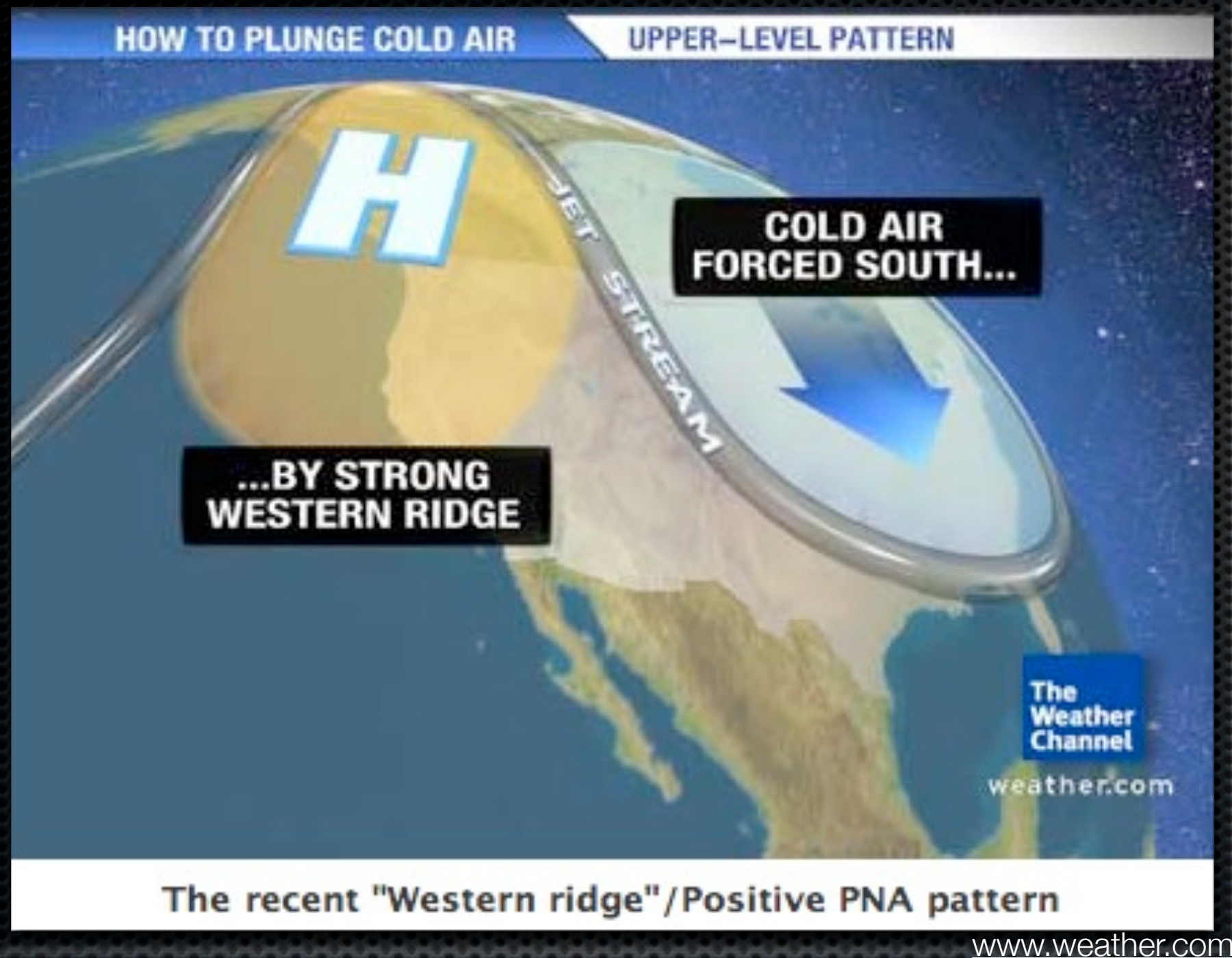


——[Positive NAO: The eastern US experiences mild and wet winter conditions.

——[Negative NAO: The US east coast experiences more cold air outbreaks and hence snowy weather conditions.



# Natural climate variability is a **cycle**.

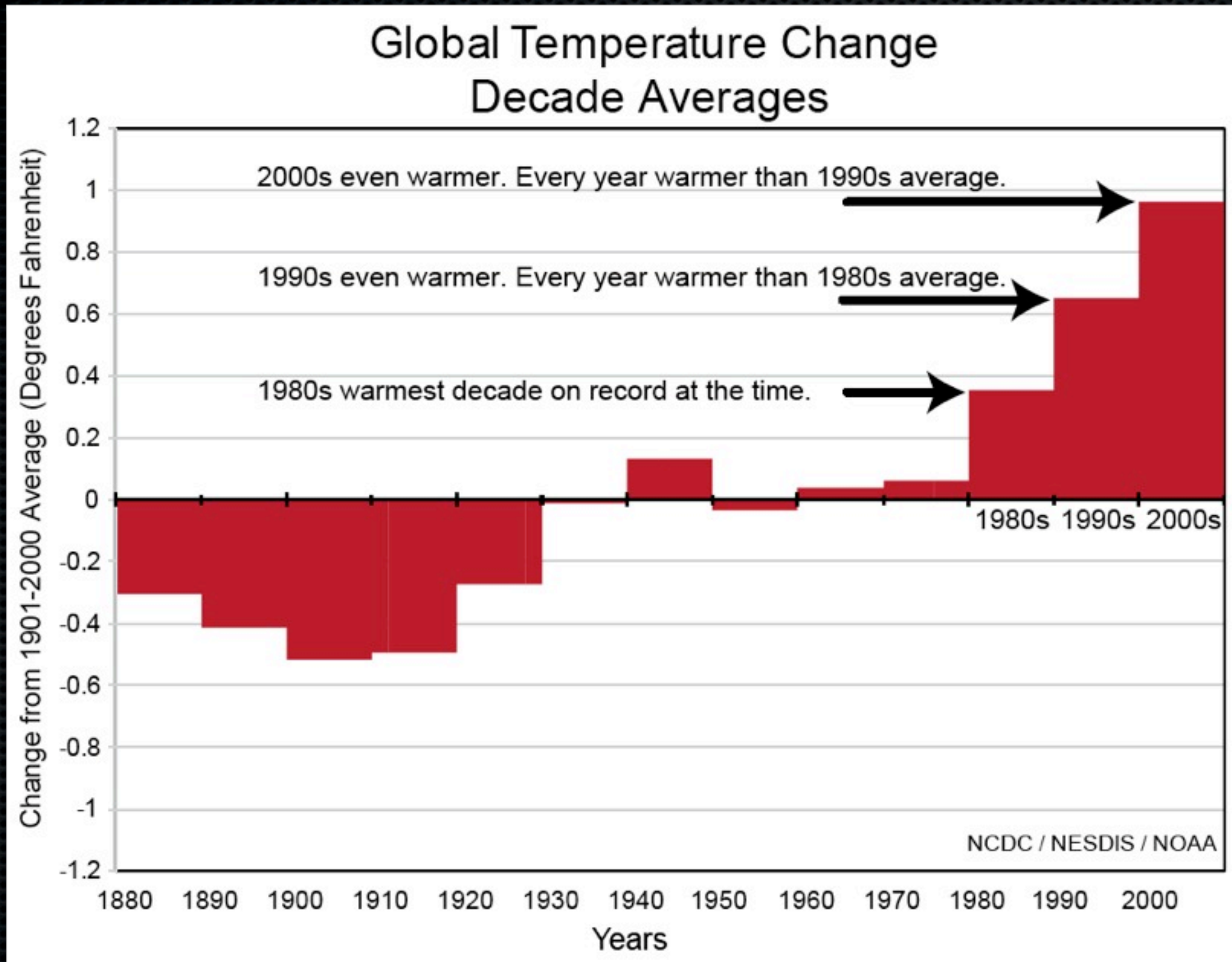


— [Positive PNA:  
Colder temps in  
central/eastern US.  
Warmer temps in  
western US.

— [Negative PNA:  
Colder/wetter across  
the western US.  
Florida and southern  
parts of southeast  
drier/warmer in winter  
months.

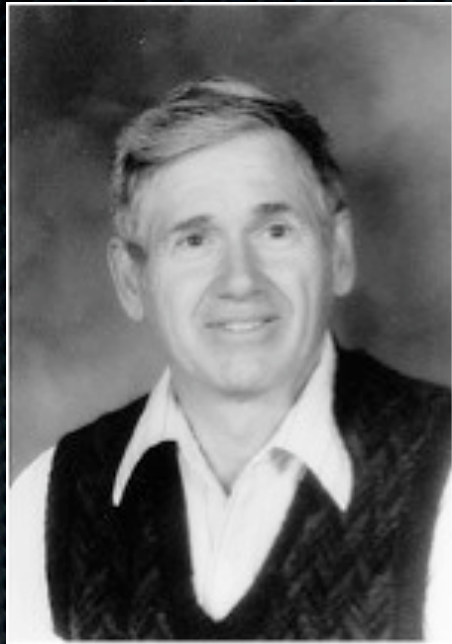


# Global warming is a trend.





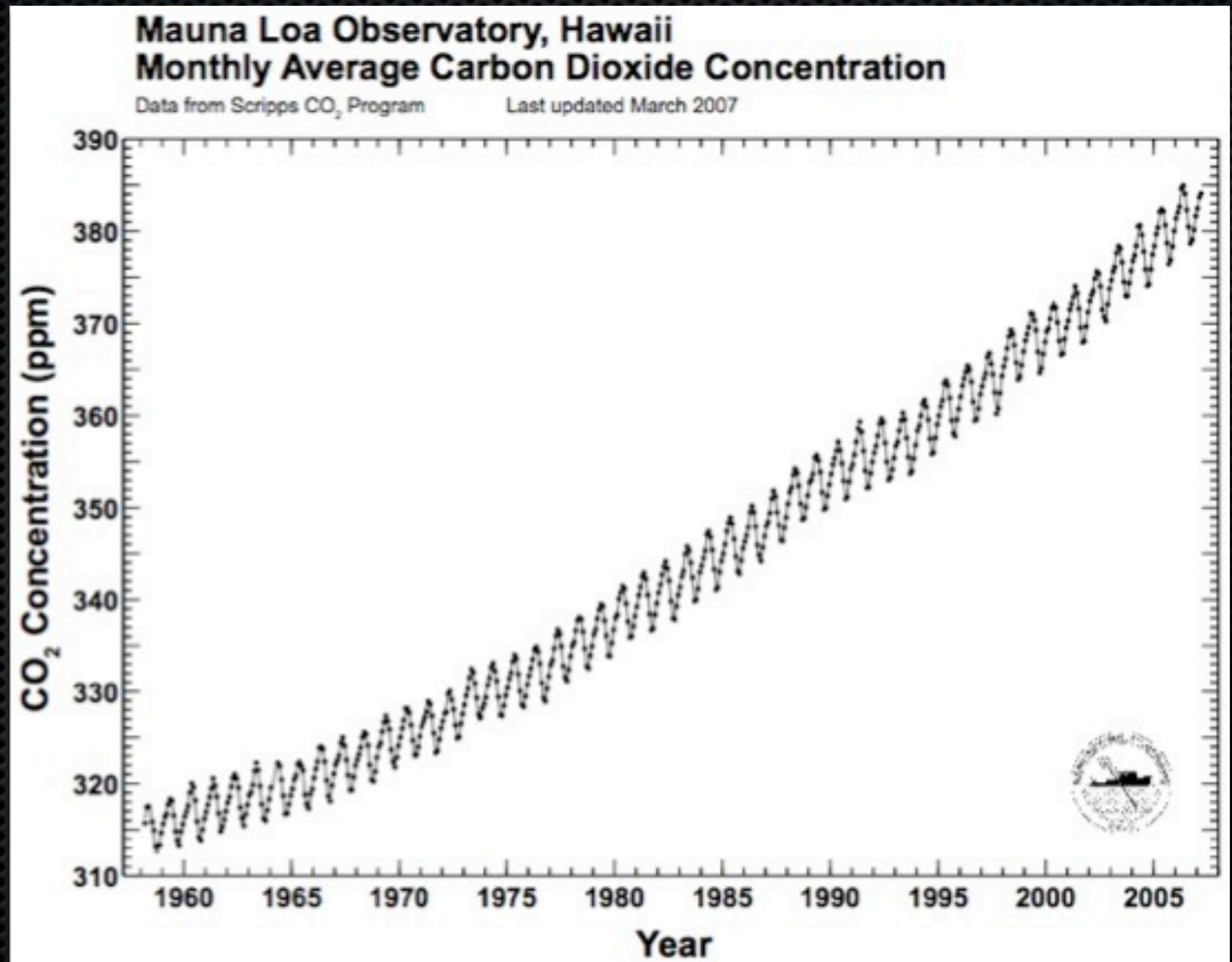
# Seeing Climate



David Keeling



Mauna Loa Observatory





# Climate Scientists Agree That...

1. Observed warming is unequivocal, human-caused and irreversible.
2. Natural climate variability is large.
3. Weather extremes are increasing.
4. The more CO<sub>2</sub> is emitted, the warmer it will become.
5. Emissions are currently above all projections.
6. Future climate scenarios are fundamentally about our choices.



# Connecting Climate to Weather

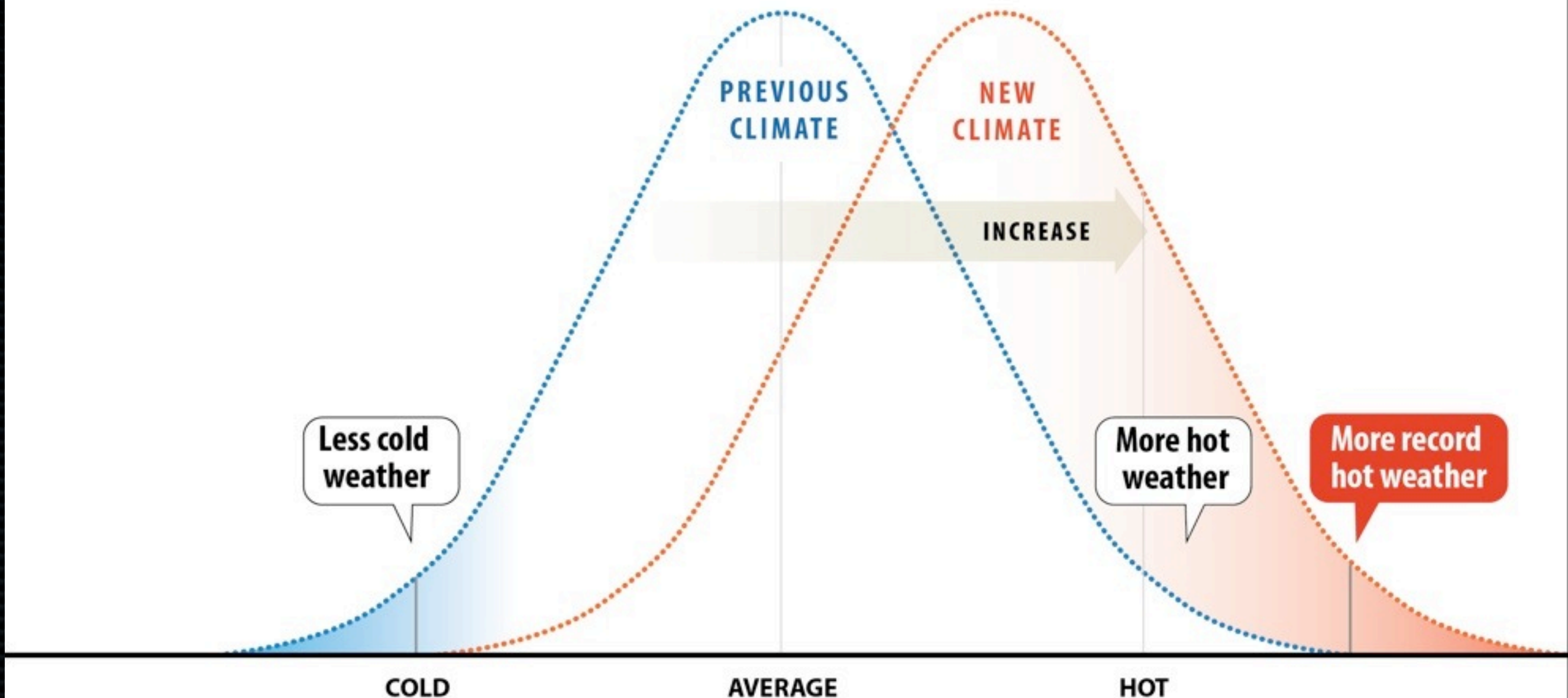
Climate is what you expect, weather is what you get.

Mark Twain



# Connecting Climate to Weather

## Effects of an increase in mean temperature



<http://www2.ucar.edu/currents/tail-record-heat>

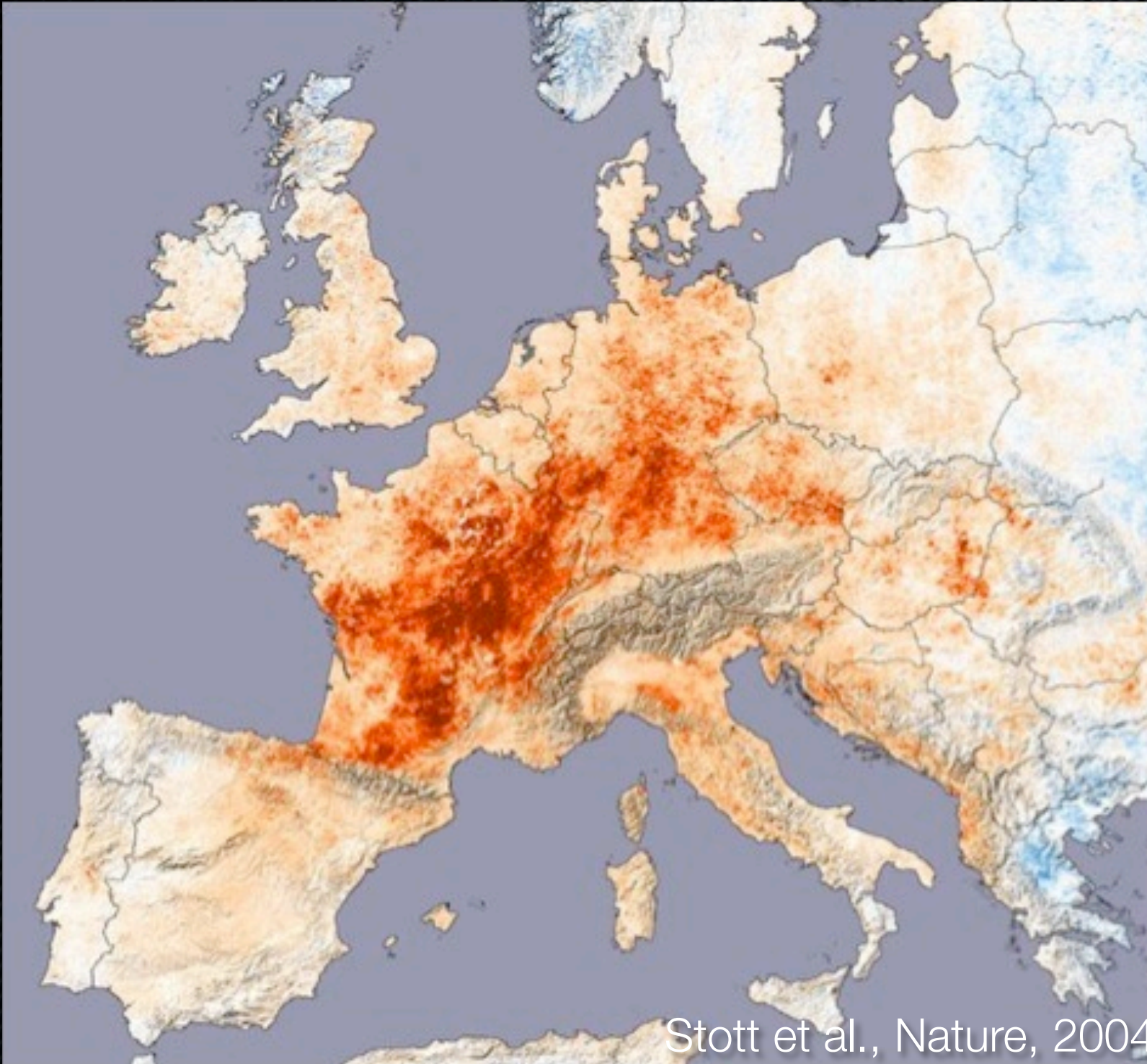
COLD

AVERAGE

HOT



# Connecting Climate to Weather



## Europe 2003

—[Summer of 2003 was probably the hottest in Europe since at latest AD 1500

—[Paris temperatures: 104F

—[Estimated 50,000 deaths



# Connecting Climate to Weather

## 2003 European Heat Wave



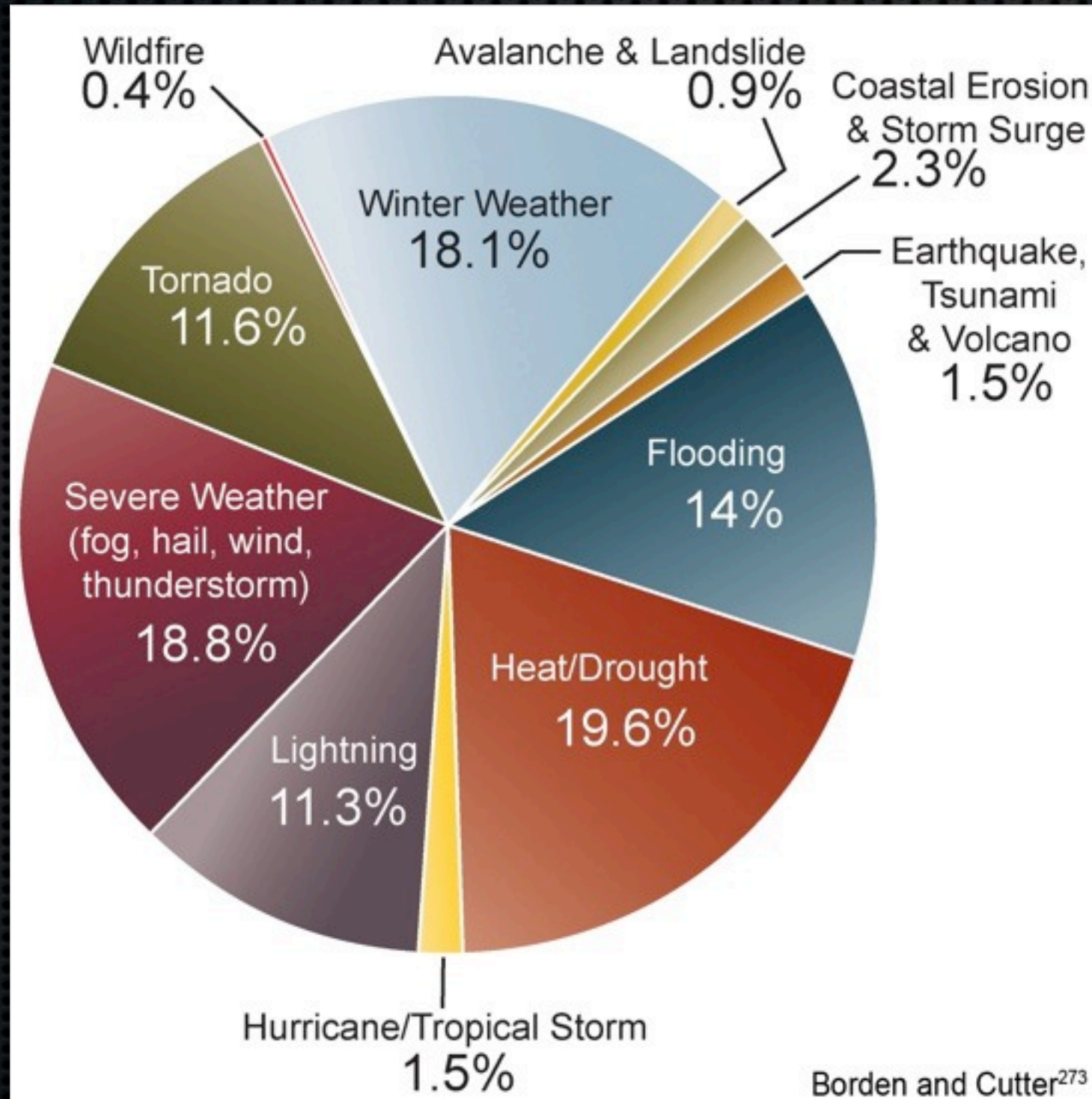
—[human influence at least doubled the chance of summers as hot as the one Europe saw in 2003]

—[models predict that by 2040, the 2003-type summers will be happening every other year]



# Seeing Extremes

## Weather related mortality



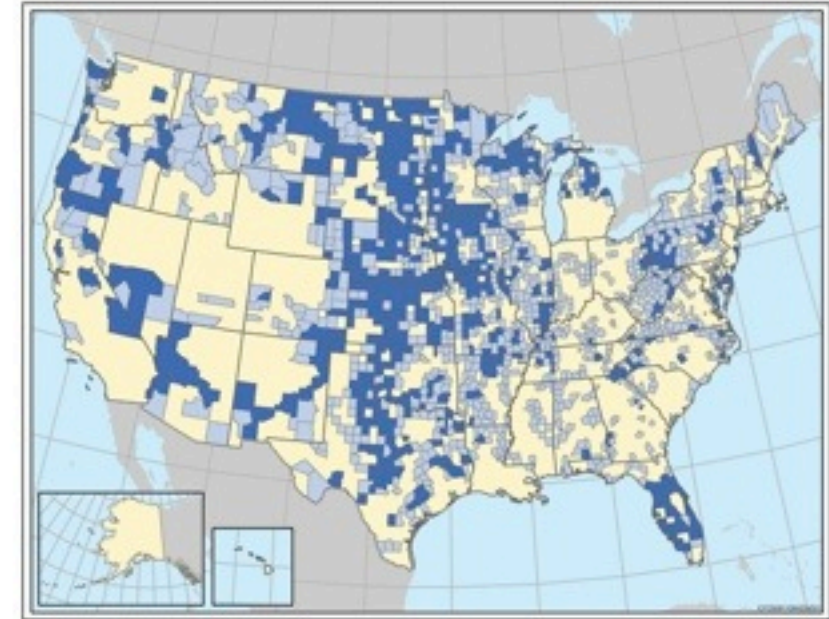


# Seeing Extremes

a) Location of Hurricane Landfalls, 1995 to 2000



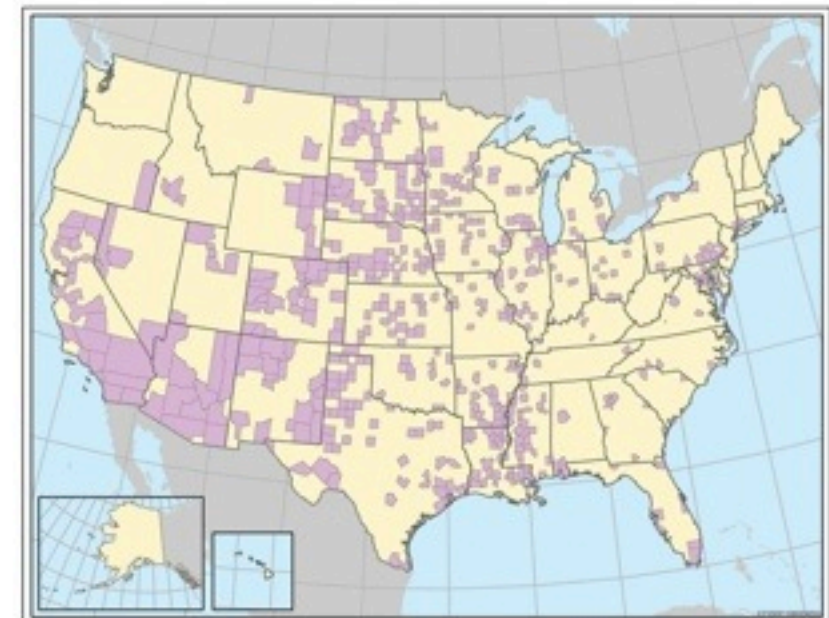
c) Percentage of Population Aged 65 or Older



b) Location of Extreme Heat Events, 1995 to 2000



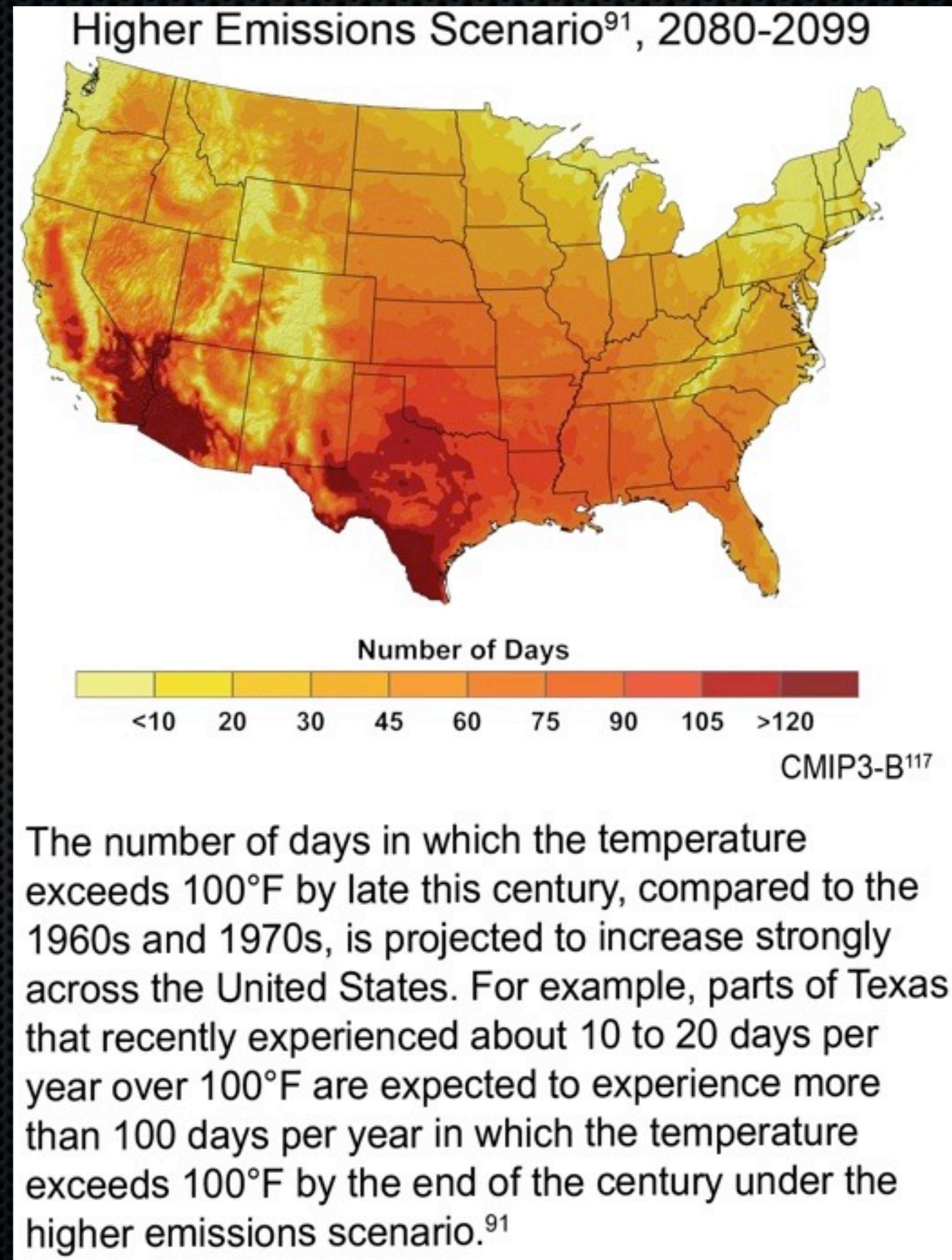
d) West Nile Virus Cases 2004





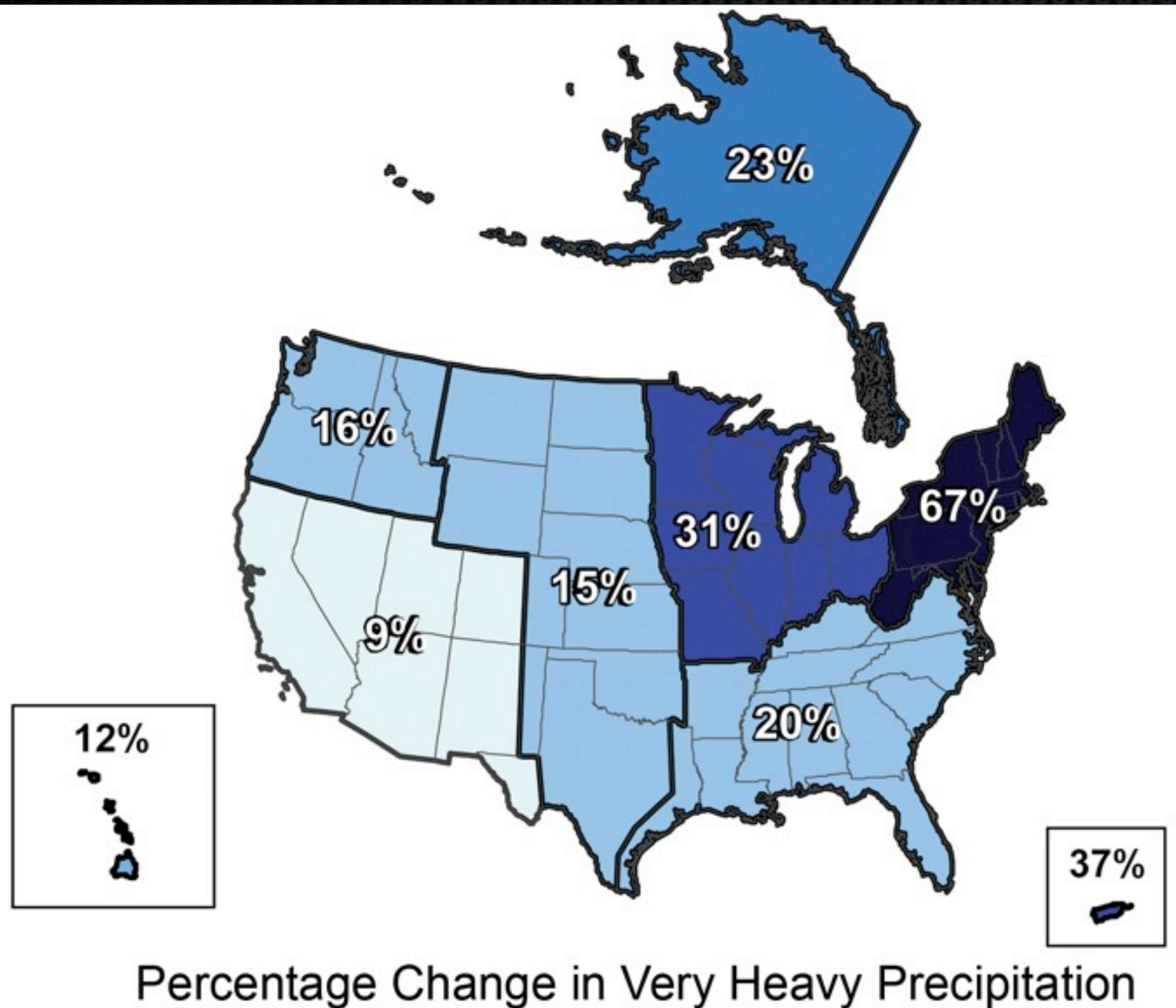
# Seeing Extremes

- [heat waves: more frequent, extreme and long lasting
- [in same weather, more people die earlier in the summer than later in the summer
- [bodies adapt physiologically to producing more sweat glands over the span of a few weeks
- [little excess mortality during first 3 days, by fifth day excess deaths in dry heat are quadruple the number in humid heat (Philly)



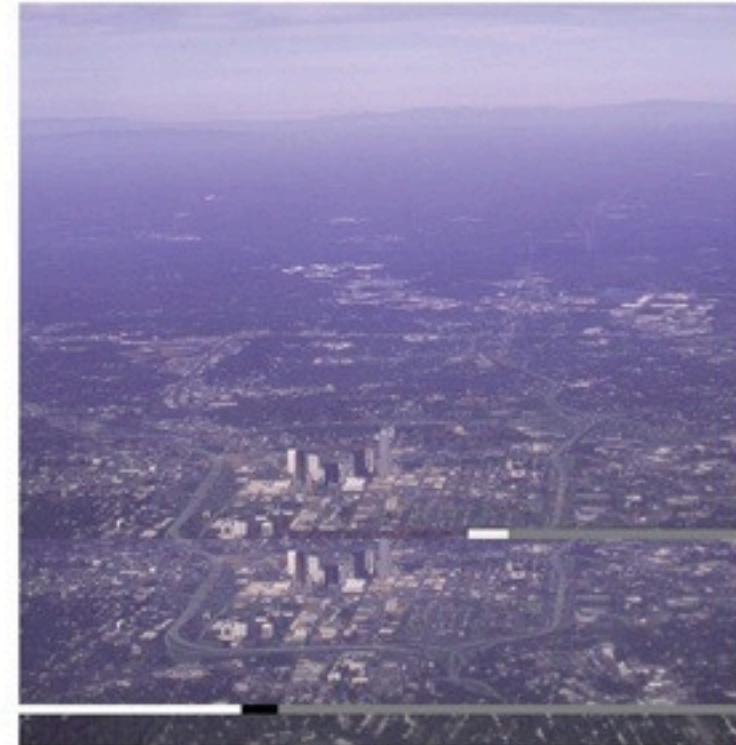
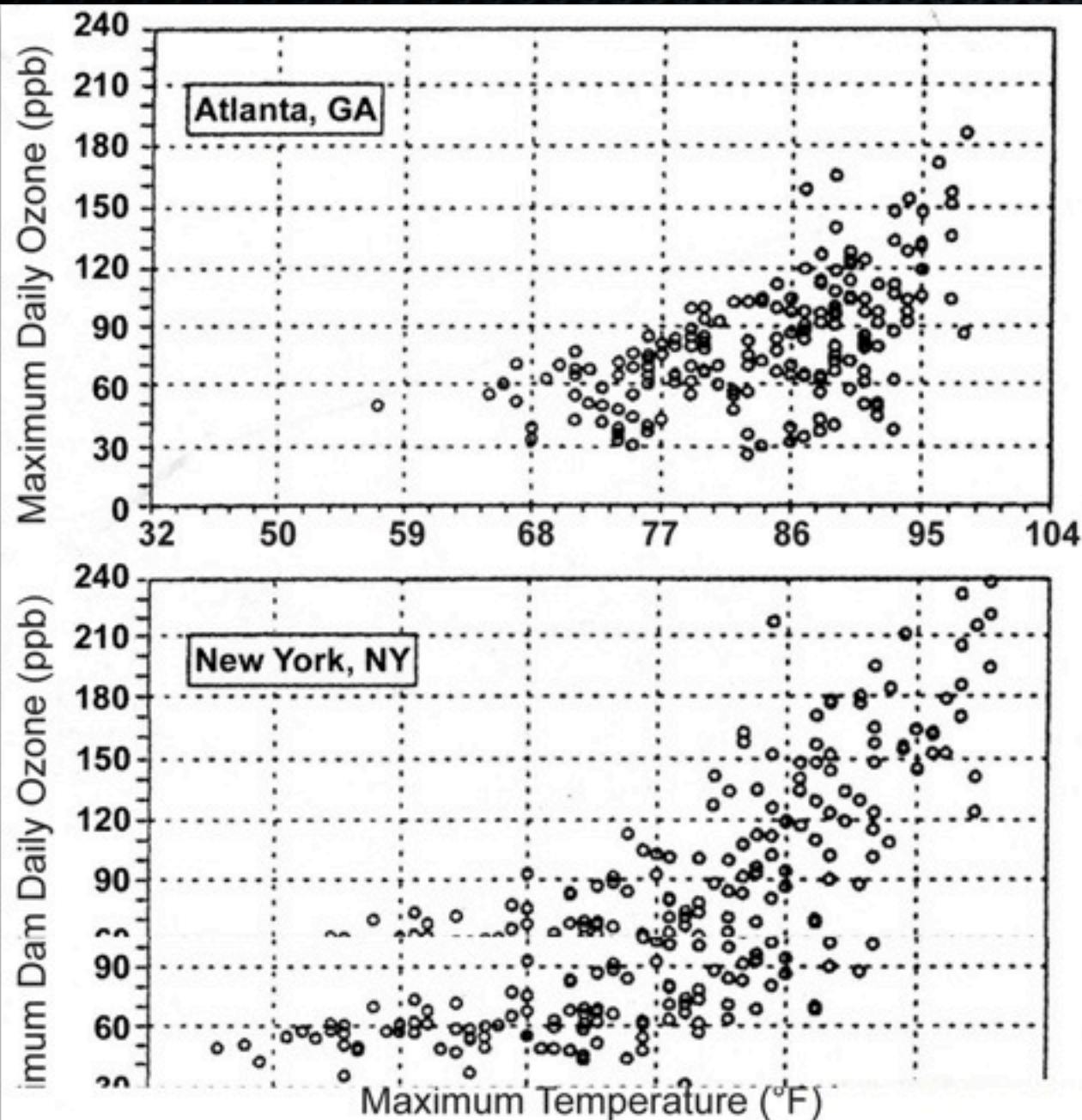


# Seeing Extremes





# Bad Air Quality

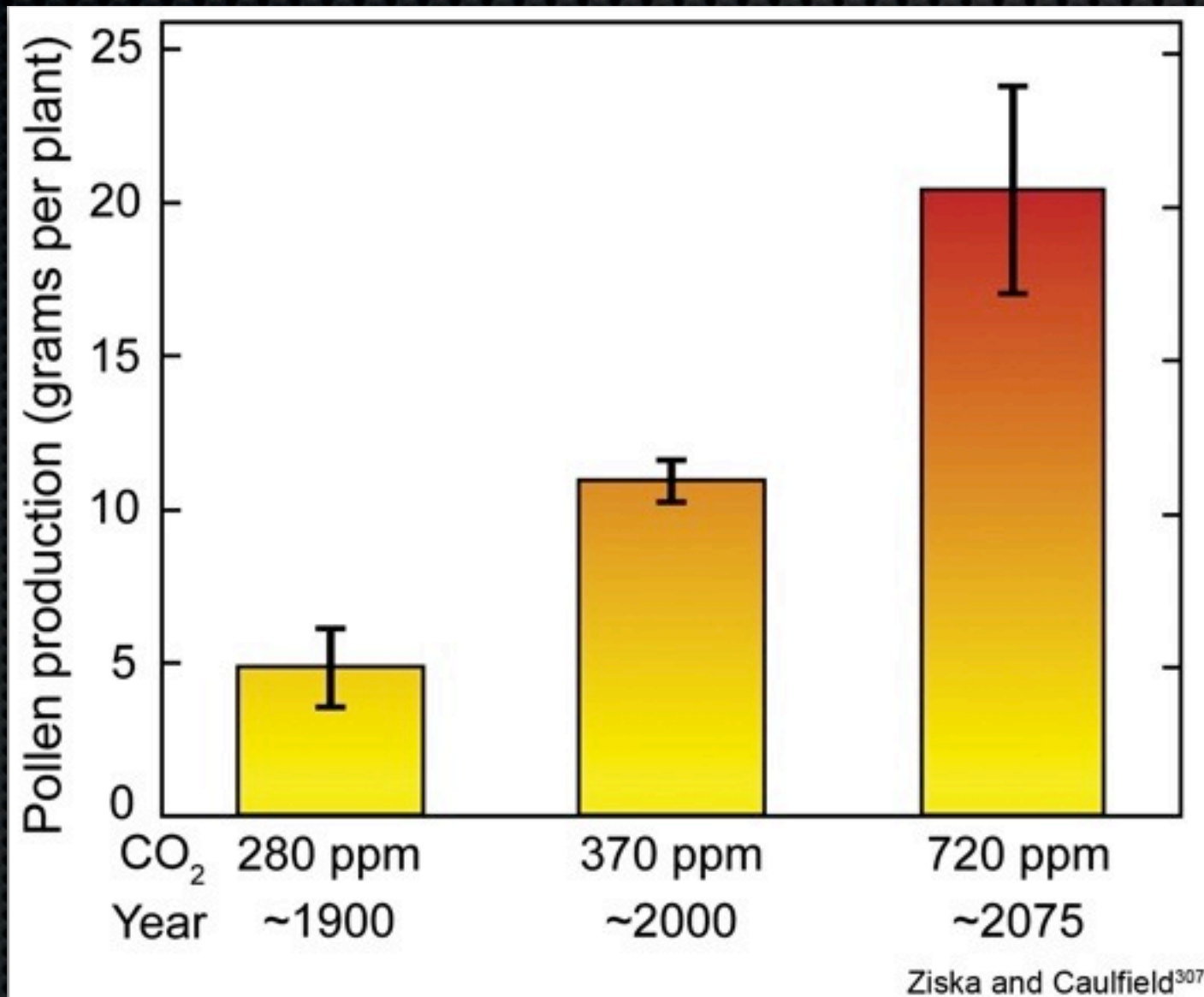


NAST<sup>219</sup>

The graphs illustrate the observed association between ground-level ozone (a component of smog) concentration and temperature in Atlanta and New York City (May to October 1988 to 1990) in parts per billion (ppb).<sup>219</sup> The projected higher temperatures across the United States in this century are likely to increase the occurrence of high ozone concentrations, although this will also depend on emissions of ozone precursors and meteorological factors. Ground-level ozone can exacerbate respiratory diseases and cause short-term reductions in lung function.



# Seeing Extremes



Pollen production from ragweed grown in chambers at the carbon dioxide concentration of a century ago (about 280 parts per million [ppm]) was about 5 grams per plant; at today's approximate carbon dioxide level, it was about 10 grams; and at a level projected to occur about 2075 under the higher emissions scenario,<sup>91</sup> it was about 20 grams.<sup>307</sup>



# Working at the Local Level

— Our weather (in South Carolina) is getting worse.

— The changes in our weather are bad for us in a variety of ways.

— The changes in our weather are happening because of the earth's changing climate.

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## CLIMATE MATTERS



CLIMATE MATTERS TRUEVIEW

LONG-TERM WINTER TEMPERATURE TREND 1976-2010

Source: FFSM

00:32 01:05

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Climate Matters: Stronger Hurricanes to... Climate Matters: Summer Heat Weather vs. Climate Extreme Heat Will Increase in Columbia July Was Hot—And It's Only Going to Get... New Report Says Global Warming 'Un...



# Seeing Extremes

## 95°F Days

July

Past

(1950-2004)

S M T W T F S

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

July

Future

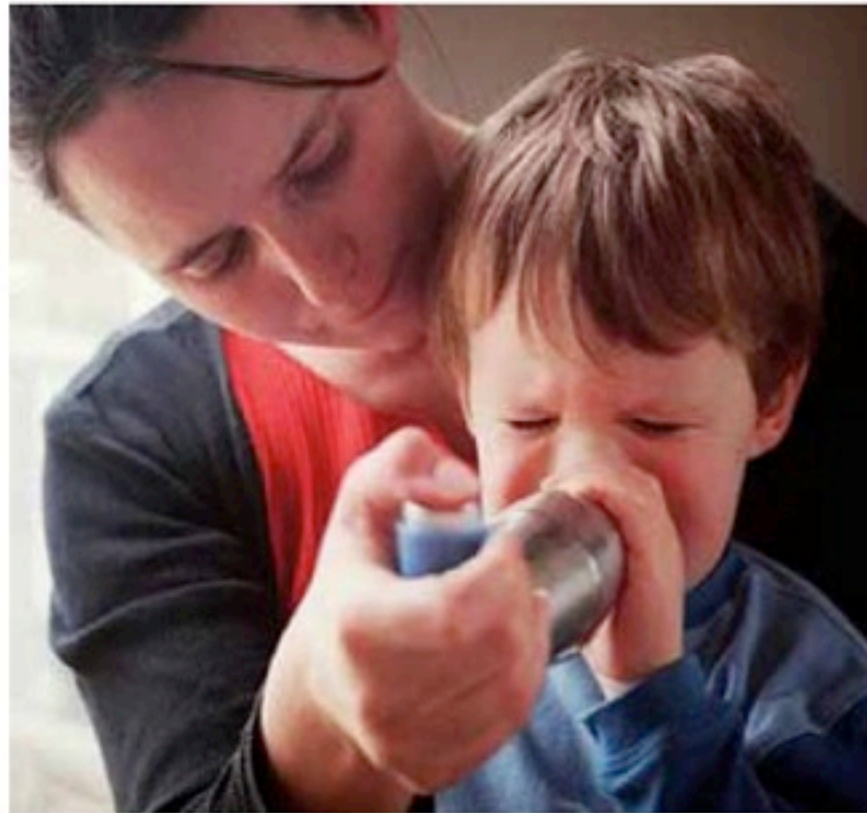
(2040-2060)

S M T W T F S

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31



# The New Normal



## Conveying the Human Implications of Climate Change

*A Climate Change Communication Primer for Public Health Professionals*

Maibach E, Nisbet M, & Weathers M. (2011) Conveying the Human Implications of Climate Change: A Climate Change Communication Primer for Public Health Professionals. Fairfax, VA: George Mason University Center for Climate Change Communication.



# Risks for Older Adults

**Table I: Health Effects of Climate Change in the United States**

Weather Event	Health Effects	Populations Most Affected
Heat Waves	Premature death Heat-related illnesses such as heat stroke, heat exhaustion, and kidney stones	The elderly Children Diabetes Poor, urban residents People with respiratory diseases Those active outdoors (workers, athletes, etc.)
Poor air quality	Increased asthma Increased chronic obstructive pulmonary disease (COPD) and other respiratory diseases	Children Those active outdoors (workers, athletes, etc.) The elderly People with respiratory diseases The poor
Hurricanes	Death from drowning Injuries Mental health impacts such as depression and post-traumatic stress disorder Increased carbon monoxide poisoning Increased gastrointestinal illness Population displacement/homelessness	Coastal residents The poor The elderly Children
Extreme rainfall and floods	Death from drowning Injuries Increased water-borne diseases from pathogens and water contamination from sewage overflows Increased food-borne disease	Residents in low-lying areas The elderly Children The poor Residents in the Southwestern U.S.
Wildfires	Death from burns and smoke inhalation Injuries Eye and respiratory illness due to fire-related air pollution	People with respiratory diseases
Droughts	Disruptions in food supply Changing patterns of crops, pests, and weed species Water shortages Malnutrition Food- and water-borne disease Emergence of new vector-borne and zoonotic disease	The poor The elderly Children

heat waves

poor air quality

hurricanes

extreme rain/floods

drought



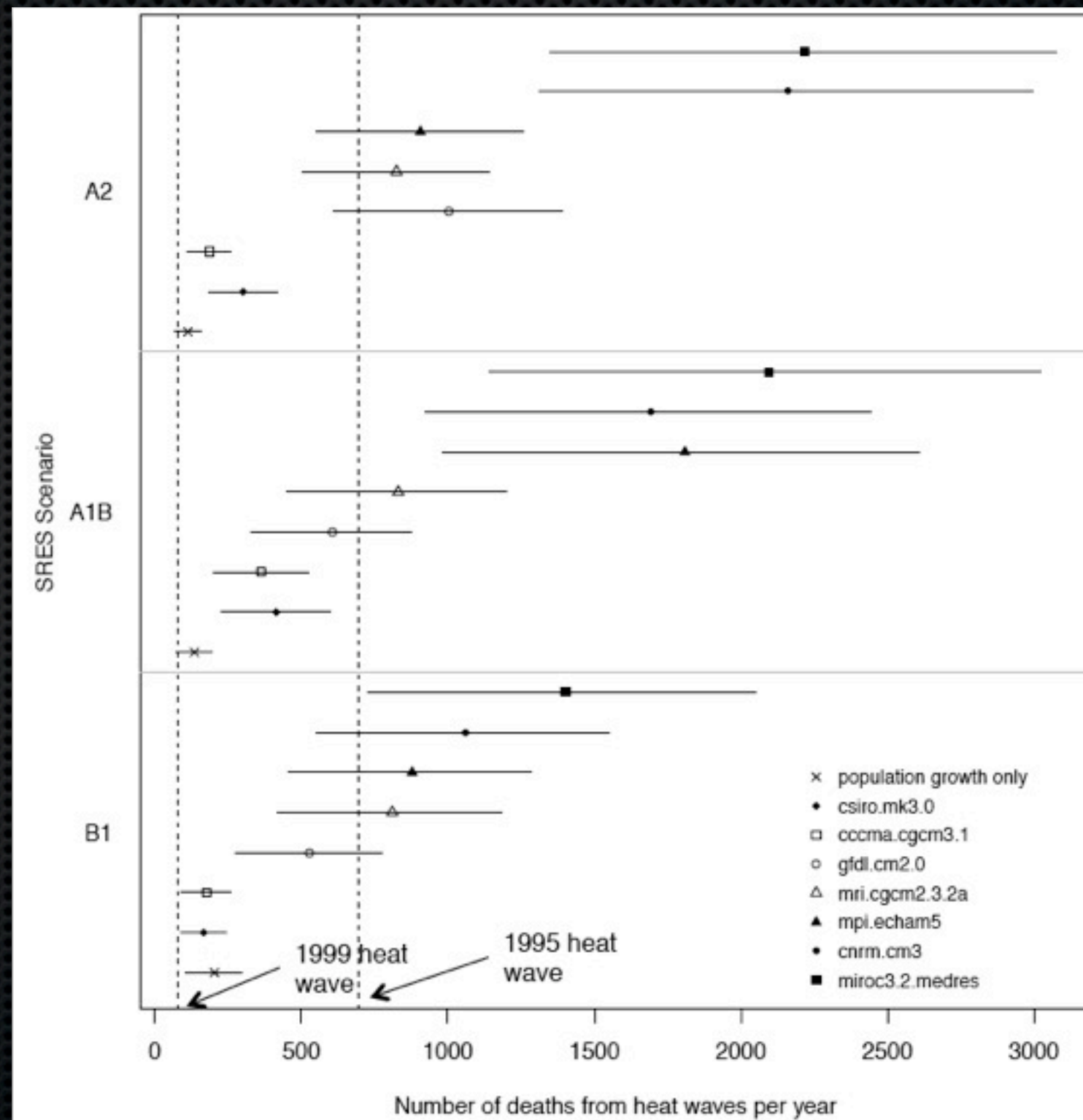
# Risks for Older Adults

**ehp** ENVIRONMENTAL  
HEALTH  
PERSPECTIVES  
ehponline.org

**Towards a Quantitative Estimate of Future Heat Wave Mortality under Global Climate Change**

Roger D. Peng, Jennifer F. Bobb, Claudia Tebaldi  
Larry McDaniel, Michelle L. Bell, and Francesca Dominici

doi: 10.1289/ehp.1002430 (available at <http://dx.doi.org/>)  
Online 30 December 2010





# Risks for Older Adults

## THE CLIMATE GAP

**Inequalities in How Climate Change Hurts Americans & How to Close the Gap**



[http://dornsife.usc.edu/pere/documents/The\\_Climate\\_Gap\\_Full\\_Report\\_FINAL.pdf](http://dornsife.usc.edu/pere/documents/The_Climate_Gap_Full_Report_FINAL.pdf)



# The New Normal

	Total Number of Households	Total Occupied Units	Black (not Hispanic)	Hispanic	Elderly (65 years or older)	Below Poverty Level
All Occupied Units	3,131,000	39.7%	58.5%	54.6%	37.5%	51.5%
Renters	1,608,900	48.1%	59.1%	58.4%	38.7%	56.3%
Homeowners	1,522,100	30.9%	57.4%	48.9%	36.8%	38.8%

**Table 1.** Percent of households without access to any air conditioning by race and SES – Los Angeles-Long Beach Metropolitan Area, California (2003)\*

\* Percentages are likely an underestimate of the true value due to the fact that more than one category may apply to a single unit in the dataset.

Adapted from: American Housing Survey for the Los Angeles-Long Beach Metropolitan Area 2004 (USCB 2004).

The Climate Gap: **Inequalities in How Climate Change Hurts Americans & How to Close the Gap**



# The New Normal

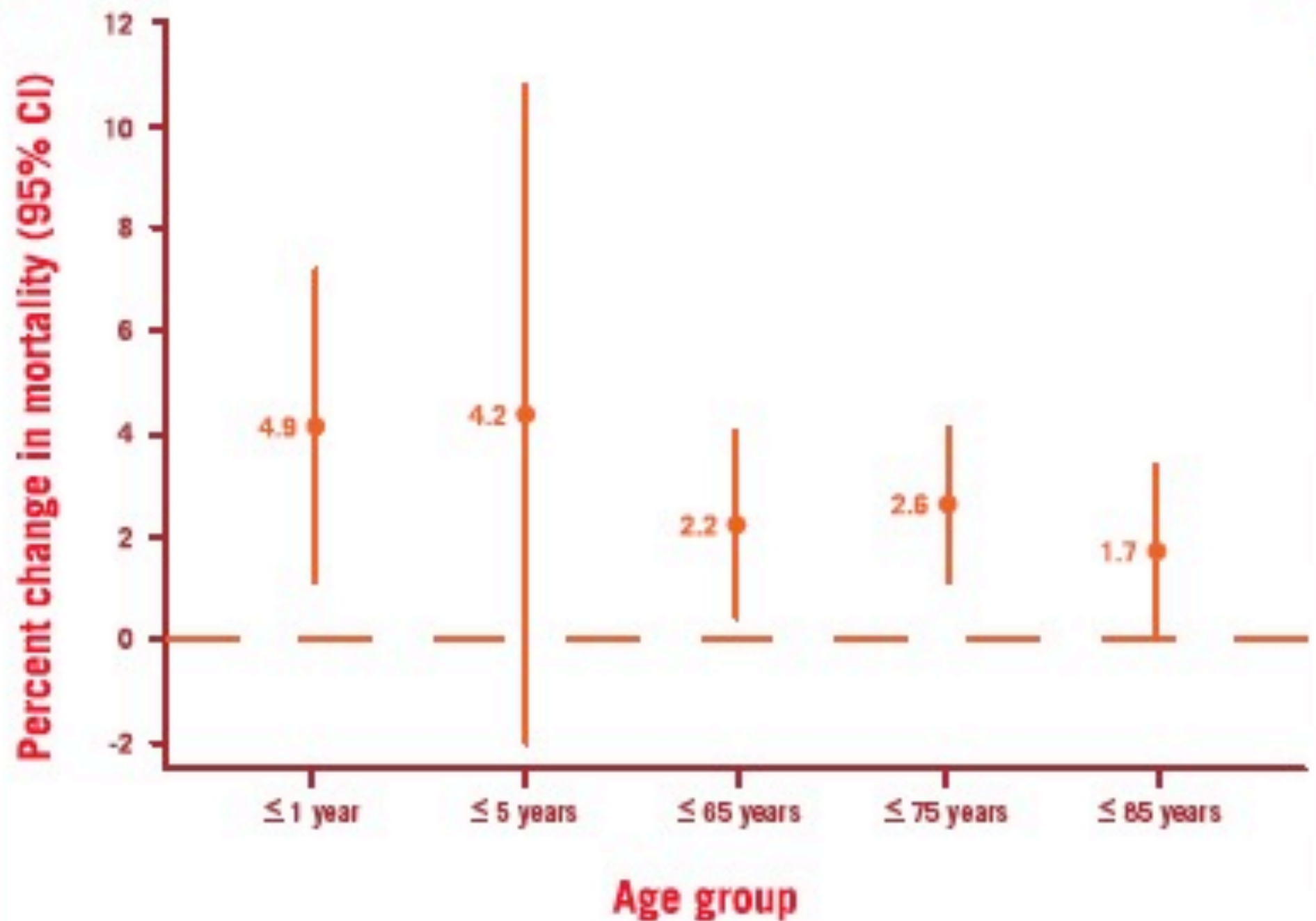


Figure 1. Percent change in mortality associated with 10°F increase in mean daily temperature by age group in nine California counties. May through September, 1999–2003 (Source: Basu and Ostro 2008).

The Climate Gap:  
**Inequalities in How  
Climate Change Hurts  
Americans & How to  
Close the Gap**



# Seeing the Future

Climate is what you affect, weather is what gets you.

Myles Allen, Oxford University